Amendments to the Claims

1 (Currently Amended) A method of forming a high power device in wide-bandgap materials with reduced junction temperature, higher power density during operation and improved re-liability at a rated power density, the method comprising:

adding a layer of diamond to a silicon carbide wafer to increase the thermal conductivity of the resulting composite wafer;

thereafter reducing the thickness of the silicon carbide portion of the composite wafer while retaining sufficient thickness of silicon carbide to support epitaxial growth thereon;

thereafter preparing the silicon carbide surface of the composite wafer for epitaxial growth thereon; and

thereafter adding a Group III nitride epitaxial layer to the prepared silicon carbide face of the wafer.

2. (Original) A method according to Claim 1 comprising adding a Group III nitride heterostructure to the prepared silicon carbide face of the wafer.

3. (Original) A method according to Claim 1 comprising growing the diamond layer on the C-face of the silicon carbide wafer and adding the heterostructure to the Si-face of the wafer.

4. (Original) A method according to Claim 1 comprising growing a polycrystalline layer of diamond.

5. (Original) A method according to Claim 1 comprising depositing a diamond layer that is thick enough to support the added heterostructure while avoiding additional material that fails to provide further functional benefit.

6. (Original) A method according to Claim 5 comprising adding a diamond layer that is between about 100 and 300 microns thick.

7. (Original) A method according to Claim 1 wherein the step of preparing the SiC surface comprises polishing the SiC surface.

8. (Original) A method according to Claim 1 wherein the step of reducing the thickness of the SiC portion comprises lapping and polishing the SiC portion.

9. (Original) A method according to Claim 1 wherein the step of reducing the thickness of the silicon carbide portion comprises:

implanting the silicon carbide substrate at a predetermined depth in the silicon carbide to form an implanted layer within the silicon carbide prior to the step of depositing the diamond;

thereafter depositing the diamond; and

thereafter reducing the thickness of the silicon carbide portion by separating the silicon carbide at the implanted layer.

10. (Original) A method according to Claim 9 comprising implanting the silicon carbide substrate with oxygen to form a layer of silicon dioxide and thereafter separating the silicon carbide at the silicon dioxide layer.

11. (Original) A method according to Claim 9 comprising implanting the silicon carbide substrate with hydrogen and thereafter separating the silicon carbide at the hydrogen-implanted layer.

12. (Original) A method according to Claim 1 comprising depositing the diamond on the silicon carbide by chemical vapor deposition.

13. (Original) A method according to Claim 12 comprising depositing two layers of diamond that differ in properties from one another.

14. (Original) A method according to Claim 1 comprising:

depositing a layer of semi-insulating diamond on a layer of semi-insulating silicon carbide to provide a semi-insulating substrate for high-frequency devices;

thereafter depositing a second layer of diamond on the semi-insulating layer to provide additional mechanical stability during wafer processing.

15. (Original) A method according to Claim 14 comprising: processing the wafer with the second diamond layer and thereafter removing portions of the second layer of diamond.

16. (Original) A method according to Claim 1 comprising bonding the diamond to the silicon carbide.

17. (Original) A method according to Claim 1 comprising adding a layer of a second material other than diamond to the diamond layer opposite the silicon carbide.

18-57. (Withdrawn)

58. (Currently Amended) A method of forming a high power device in wide-bandgap materials with reduced junction temperature, higher power density during operation and improved re-liability at a rated power density, the method comprising:

adding a layer of a higher thermal conductivity material to a wafer of lower thermal conductivity material in which the lower thermal conductivity material has a better crystal lattice match with Group III nitrides than does the higher thermal conductivity material to thereby increase the thermal conductivity of the resulting composite wafer;

thereafter reducing the thickness of the lower thermal conductivity portion of the composite wafer while retaining sufficient thickness of the lower thermal conductivity portion to support epitaxial growth thereon;

thereafter preparing the lower thermal conductivity surface of the composite wafer for epitaxial growth thereon; and

thereafter adding at least one Group III nitride epitaxial layer to the prepared lower thermal conductivity face of the wafer.

59. (Original) A method according to Claim 58 comprising adding the higher thermal conductivity material from the group consisting of metals, boron nitride and diamond.

60. (Original) A method according to Claim 58 wherein the lower thermal conductivity material is selected from the group consisting of silicon, gallium nitride, aluminum nitride, aluminum gallium nitride, zinc oxide, lithium acuminate, lithium gallate, magnesium oxide, magnesium aluminate, nickel aluminate and sapphire.

61. (Original) A method according to Claim 58 wherein the step of adding the at least one Group Ill nitride epitaxial layer comprises adding at least one Group III nitride heterostructure.

62. (Original) A method according to Claim 58 wherein the step of adding the higher thermal conductivity material comprises growing a polycrystalline layer of diamond.

63. (Original) A method according to Claim 58 comprising depositing a diamond layer that is thick enough to support the added heterostructure while avoiding additional material that fails to provide further functional benefit.

64. (Original) A method according to Claim 63 comprising adding a diamond layer that is between about 100 and 300 microns thick.

65. (Original) A method according to Claim 58 wherein the step of reducing the thickness of the lower thermal conductivity portion comprises lapping and polishing the lower thermal conductivity portion.

66. (Original) A method according to Claim 58 wherein the step of reducing the thickness of the lower thermal conductivity portion comprises:

implanting the lower thermal conductivity portion at a predetermined depth in the lower thermal conductivity portion to form an implanted layer within the lower thermal conductivity portion prior to the step of depositing the diamond;

thereafter depositing the diamond; and

thereafter reducing the thickness of the lower thermal conductivity portion by separating the lower thermal conductivity portion at the implanted layer.

67. (Original) A method according to Claim 66 comprising implanting the lower thermal conductivity portion with oxygen to form an oxide layer and thereafter separating the lower thermal conductivity portion at the oxide layer.

68. (Original) A method according to Claim 66 comprising implanting the lower thermal conductivity portion with hydrogen and thereafter separating the lower thermal conductivity portion at the hydrogen-implanted layer.

69. (Original) A method according to Claim 58 comprising depositing the diamond on the lower thermal conductivity portion by chemical vapor deposition.

70. (Original) A method according to Claim 69 comprising depositing respective first and layers of diamond that differ in properties from one another.

71. (Original) A method according to Claim 70 comprising: processing the wafer with the second diamond layer and thereafter removing portions of the second layer of diamond.

72. (Original) A method according to Claim 58 comprising bonding the diamond to the lower thermal conductivity portion.

73. (Original) A method according to Claim 58 wherein the step of adding a higher thermal conductivity material comprises adding a metal selected from the group consisting of nickel, tungsten, molybdenum and alloys thereof.

THE REMAINDER OF THIS PAGE IS INTENTIONALLY LEFT BLANK